

# Water in the Hydroclimate

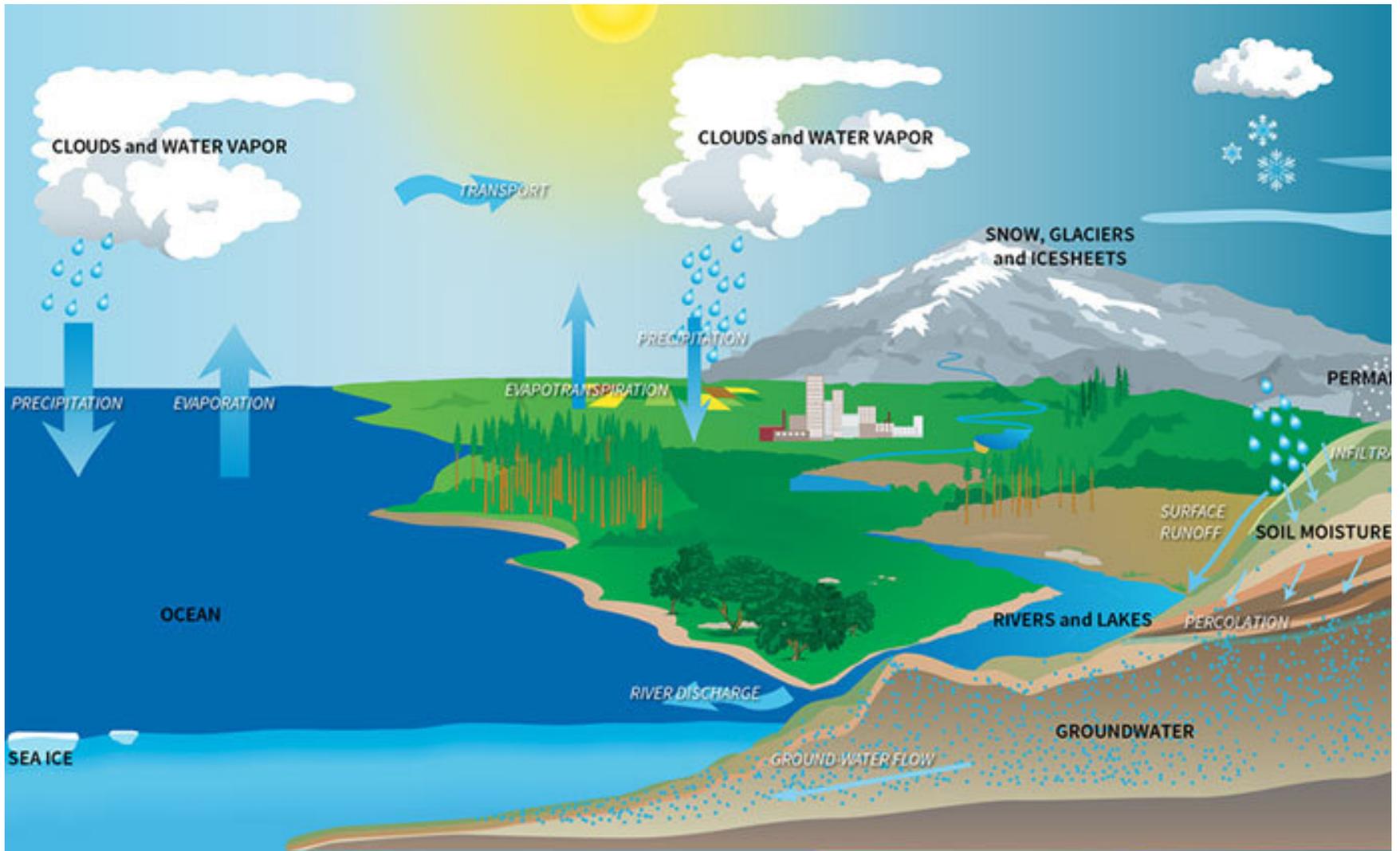
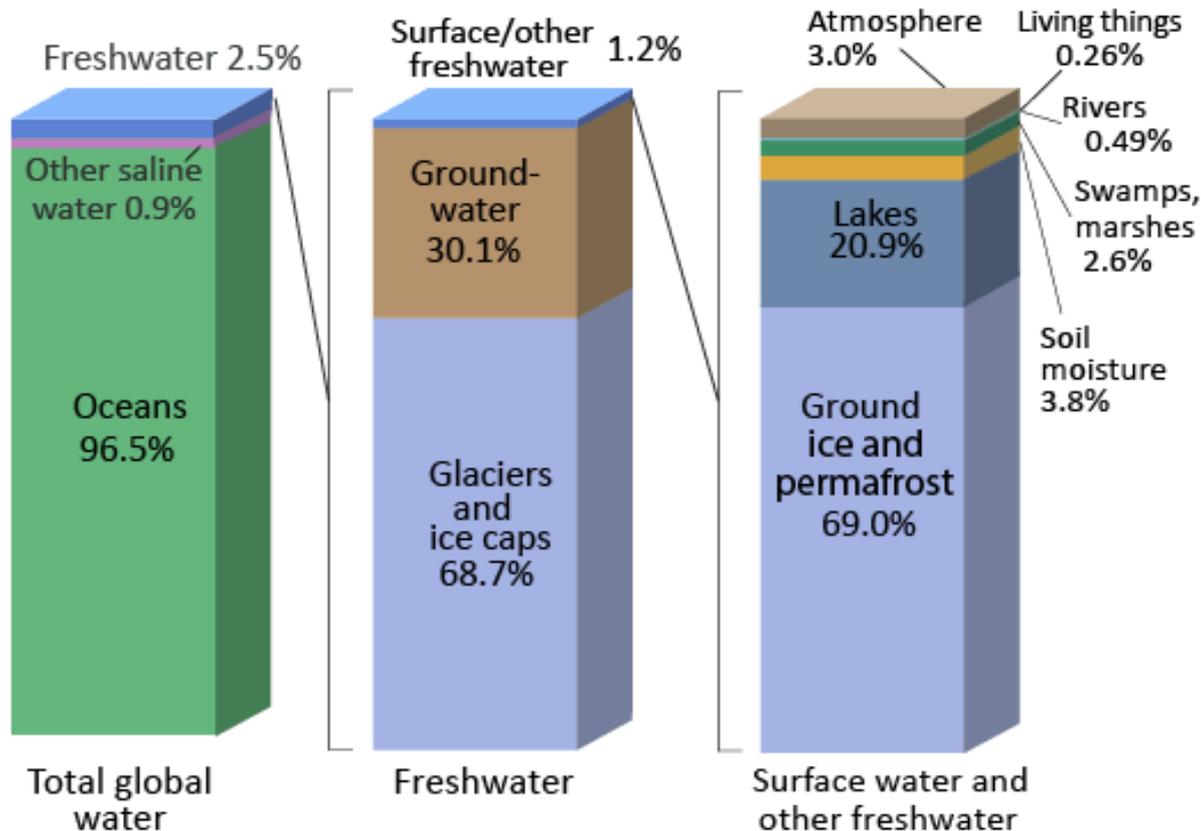


Figure courtesy of NASA: [http://climate.nasa.gov/system/news\\_items/main\\_images/2307\\_waterbudget1\\_768\\_60.jpg](http://climate.nasa.gov/system/news_items/main_images/2307_waterbudget1_768_60.jpg)

# Where is the Freshwater?

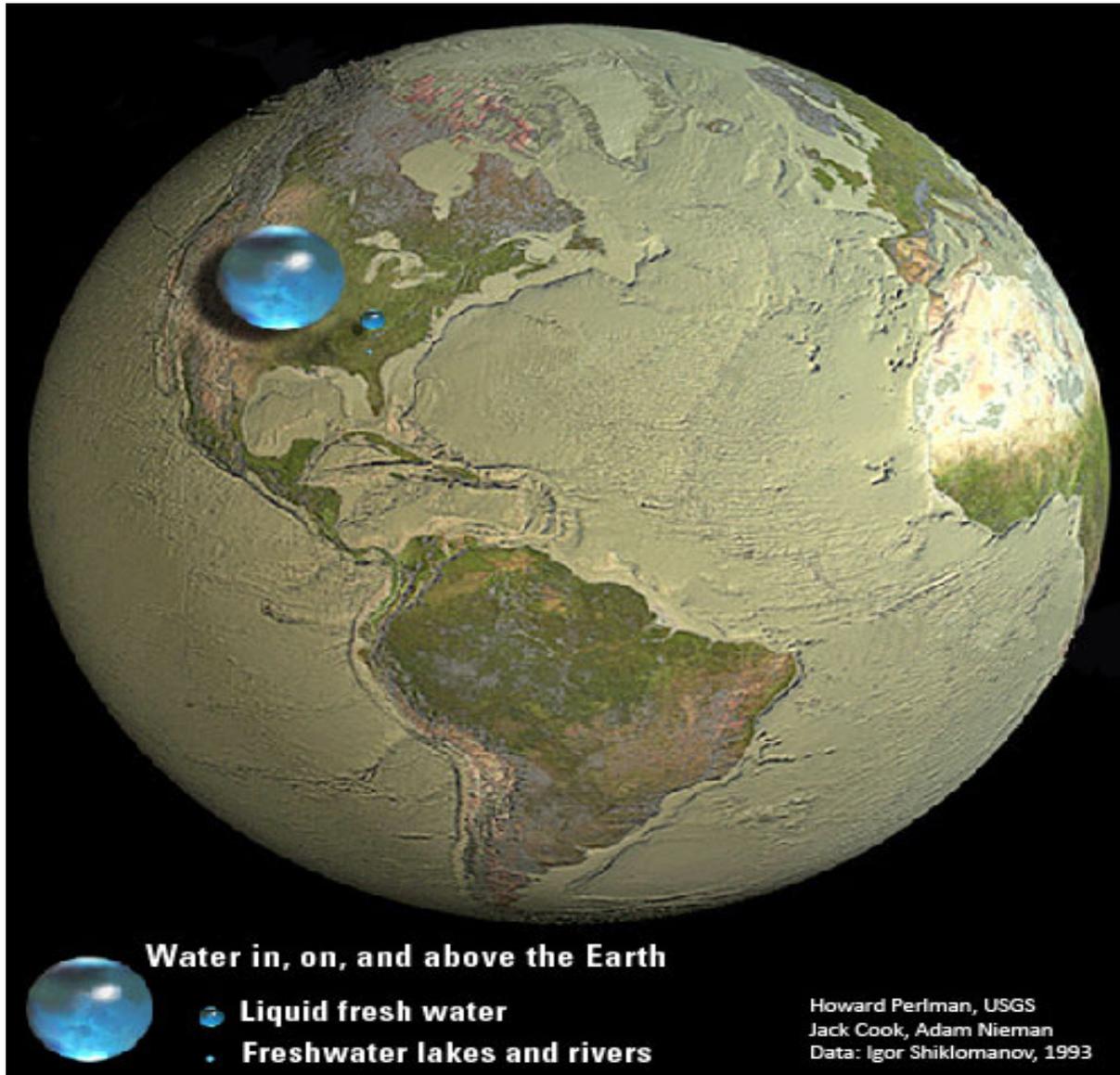
## Where is Earth's Water?



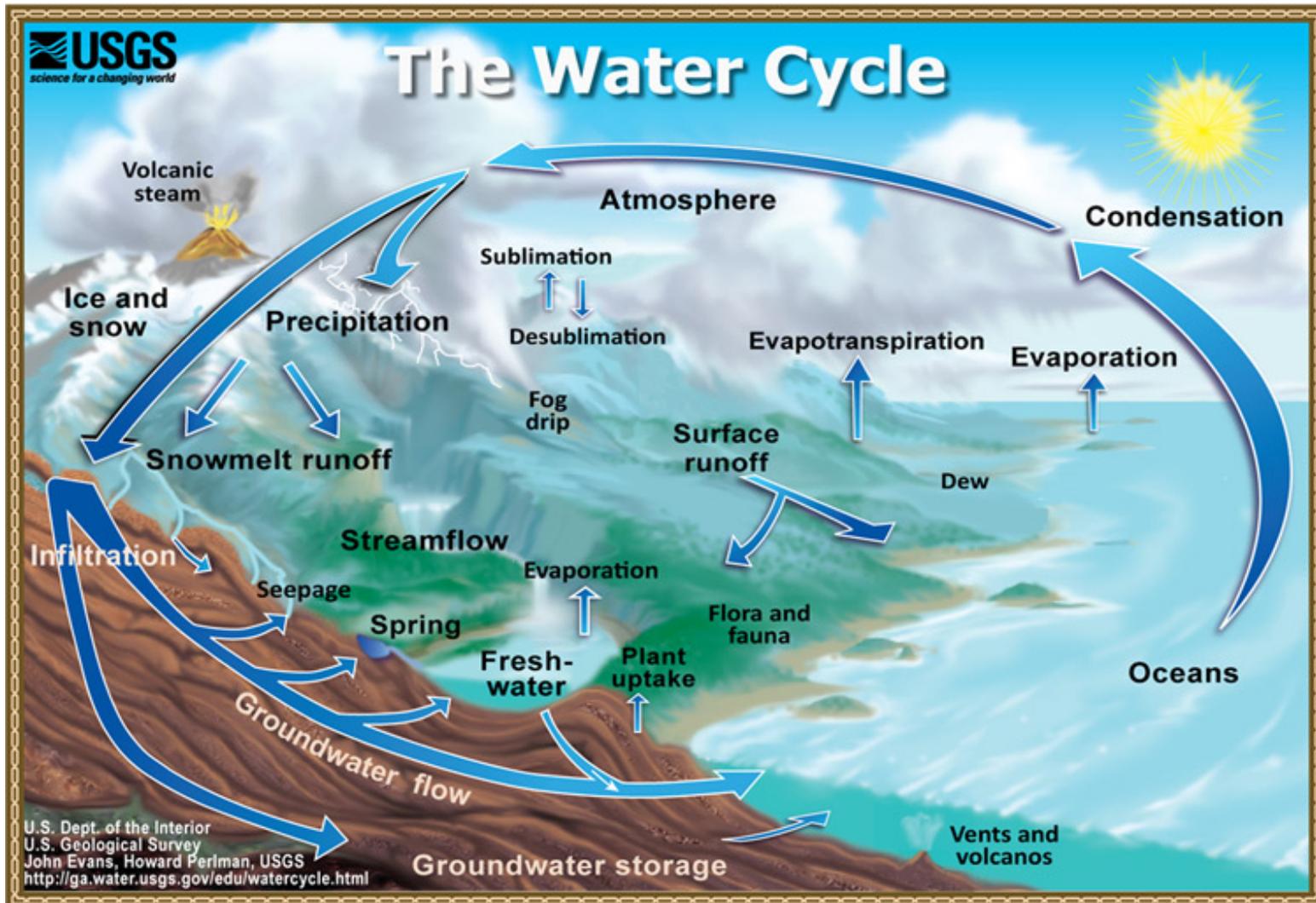
Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World's Fresh Water Resources*.

NOTE: Numbers are rounded, so percent summations may not add to 100.

# Another way to look at it...



# The "Natural" Water Cycle



# How Does the Water Cycle Change as Climate Changes?

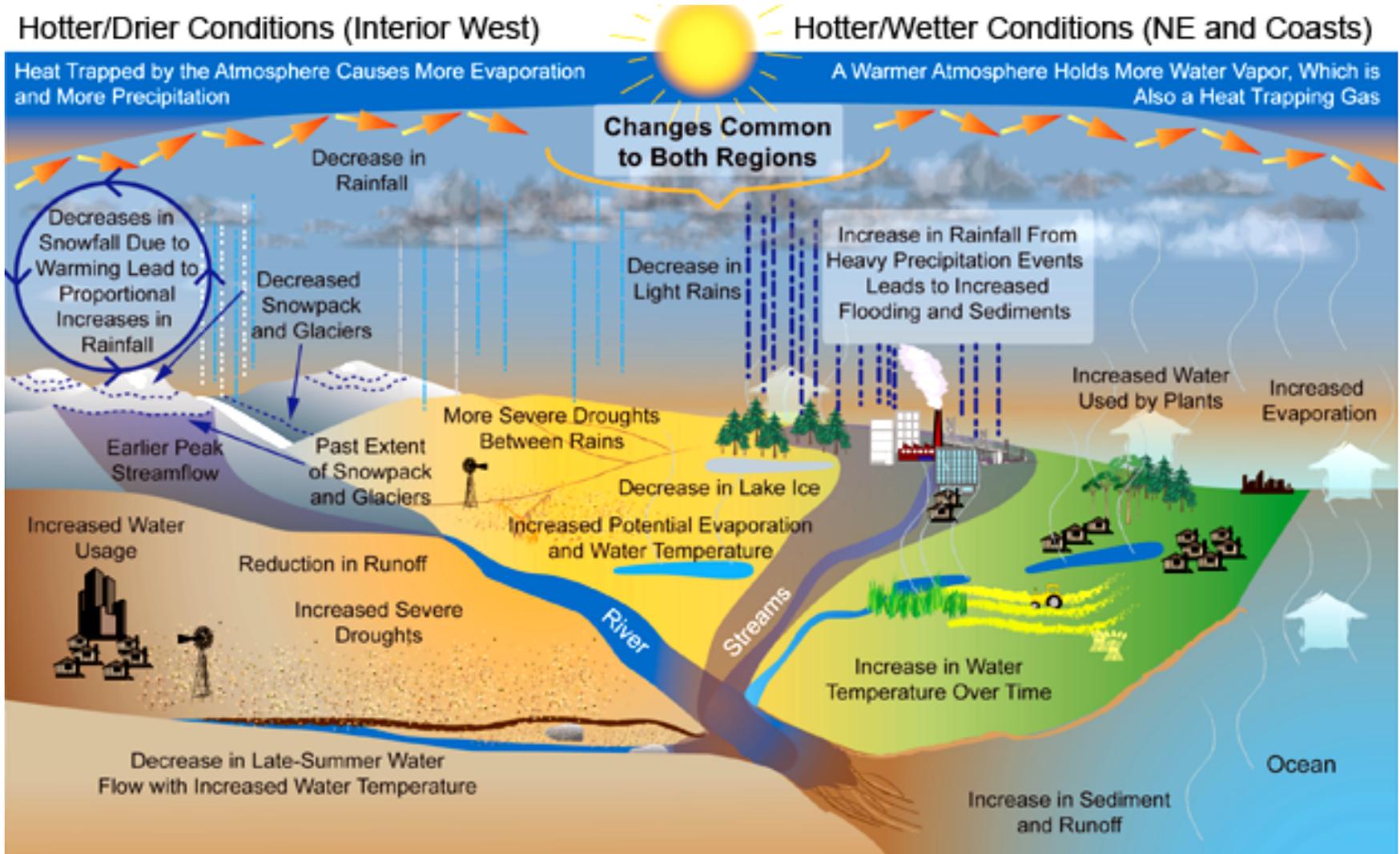
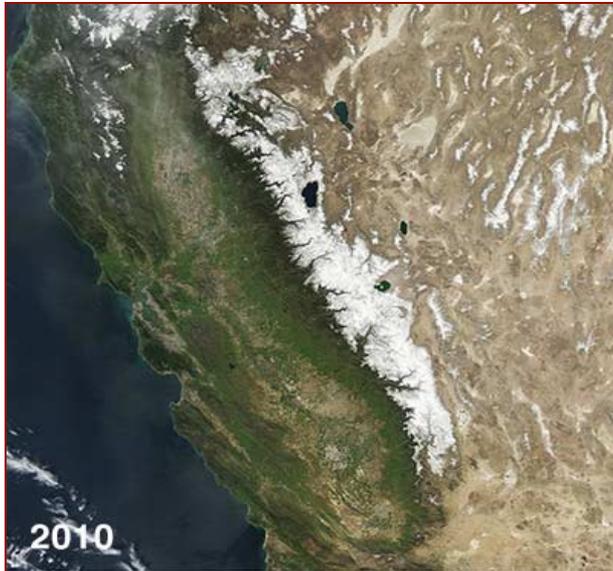


Figure Courtesy of U.S. EPA: <http://www3.epa.gov/climatechange/images/impacts-adaptation/WaterCycleChanges.jpg>

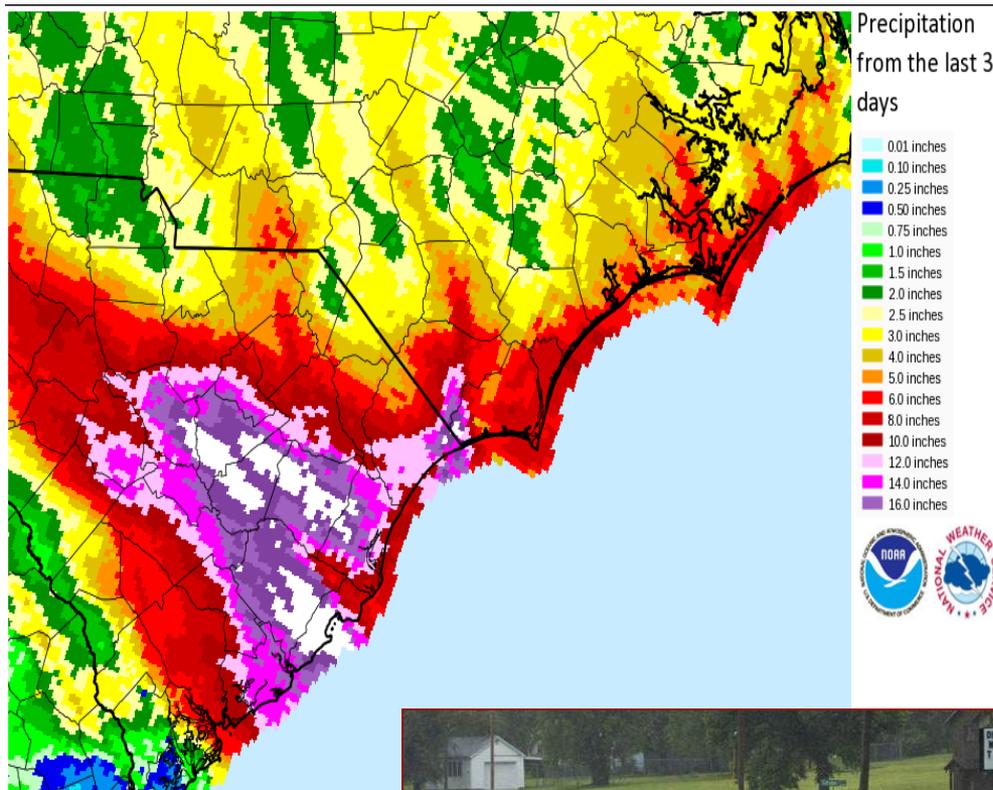
# Extreme Atmospheric Processes Involving The Water Cycle



- Snowpack in the Sierra Nevada Mountain Range. Year 2010 vs Year 2015.
- Can you think of ways that lack of snowpack affects society in major U.S. West cities?

Figure courtesy of NASA: [http://www.giss.nasa.gov/research/features/201511\\_snowpack/sierra\\_amo\\_400.jpg](http://www.giss.nasa.gov/research/features/201511_snowpack/sierra_amo_400.jpg)

# Extreme Atmospheric Processes Involving The Water Cycle



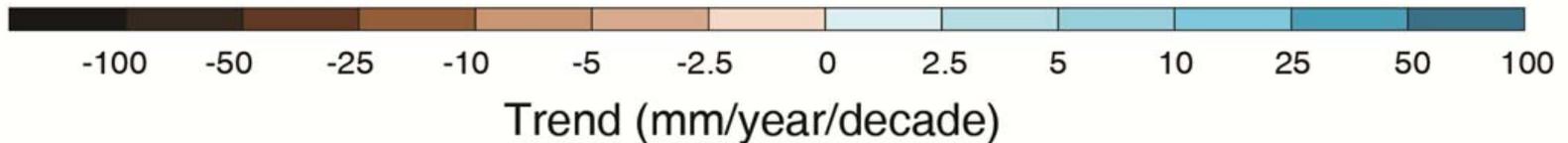
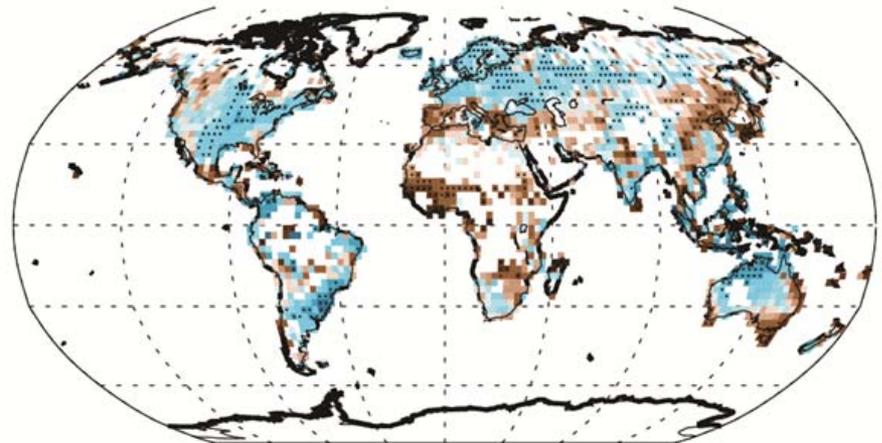
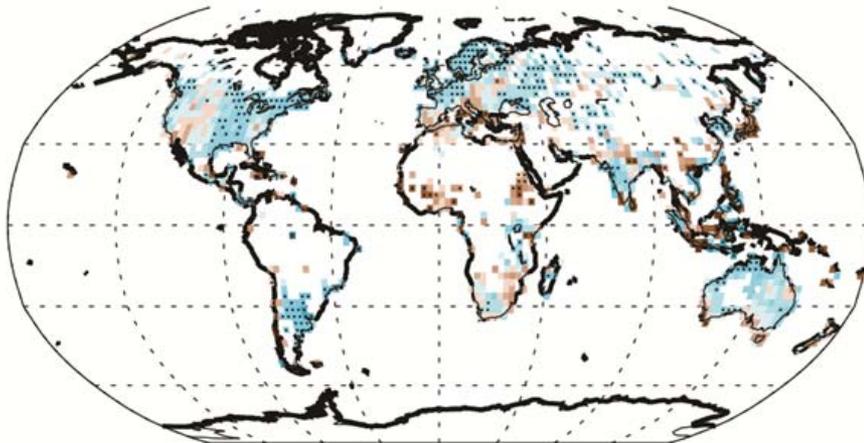
- National Weather Service precipitation estimates in 2015 South Carolina Floods
- How does such a large amount of rainfall lead to urban flooding?
  - Are there factors beyond rain?

# More extreme precipitation observed and expected globally

## Observed change in precipitation over land

1901–2010

1951–2010

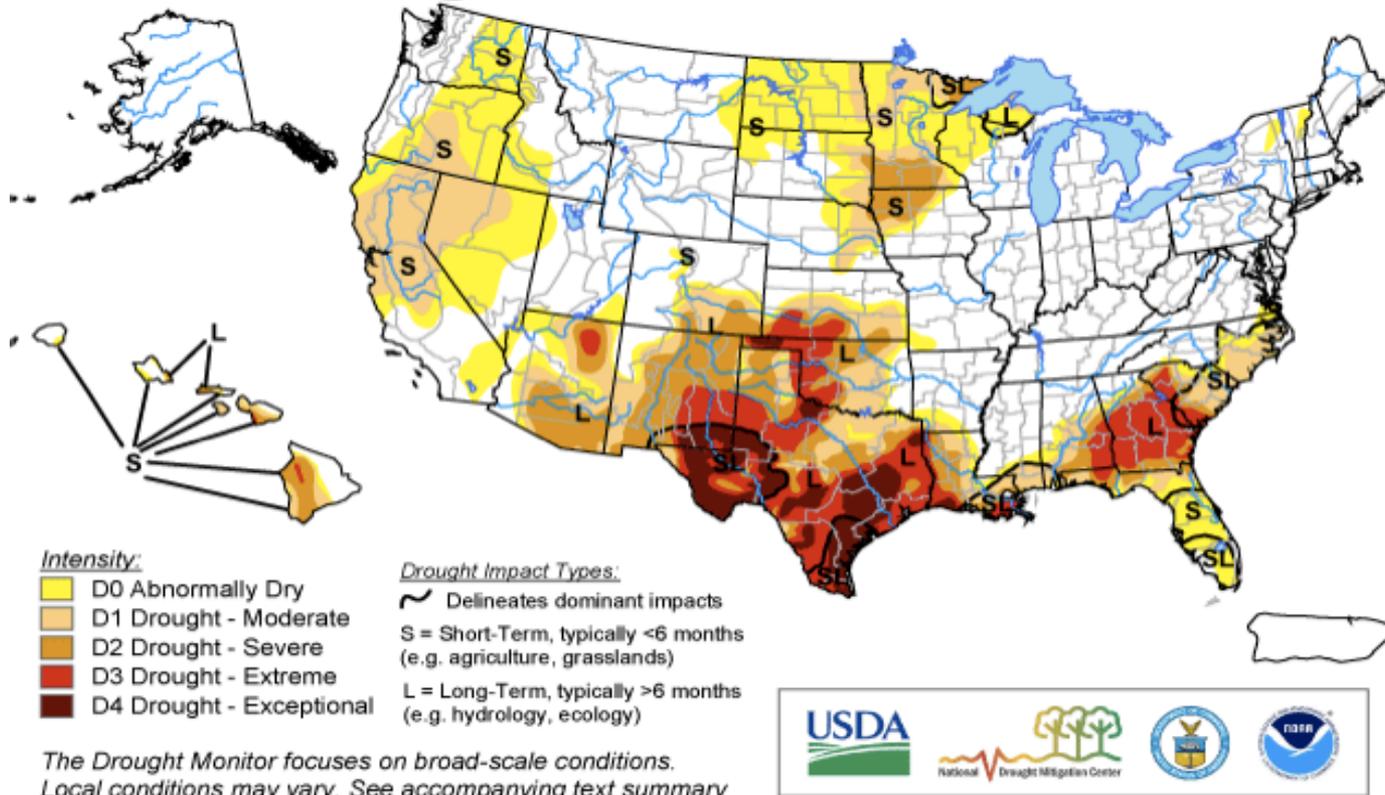


An Example: 2011-2012 Texas drought had a major impact on society.

Discuss 3 potential impacts.....

## U.S. Drought Monitor

January 3, 2012  
Valid 7 a.m. EST



<http://droughtmonitor.unl.edu/>



# Resources on Water

- USGS Water Page,  
<http://water.usgs.gov/edu/mwater.html>
  - Earth's Water
  - Water Properties
  - Hydroelectricity
  - Events and Hazards
  - Using Water
  - Activity Center



- We have seen changes at global scale. What about changes at the urban to regional scale?
- The next powerpoint associated with the module will discuss.

